

## WHAT IS CLAIMED IS:

- 1     1. A wavelength converter comprising:
  - 2         a first semiconductor laser for outputting light with
  - 3         a constant intensity and with a first wavelength forming
  - 4         a wavelength to be obtained when a signal light is
  - 5         inputted to said wavelength converter and undergoes
  - 6         wavelength conversion in said wavelength converter;
  - 7         a first semiconductor optical amplifier for
  - 8         intensity-modulating the output light with said first
  - 9         wavelength from said first semiconductor laser through
  - 10       the use of the inputted signal light so that the output
  - 11       light falls into an opposite phase condition with respect
  - 12       to the inputted signal light;
  - 13         a second semiconductor laser for outputting a light
  - 14         with a constant intensity and with a second wavelength
  - 15         different from that of the inputted signal light and that
  - 16         of the output light from said first semiconductor laser;
  - 17         a second semiconductor optical amplifier for
  - 18         intensity-modulating the output light with said second
  - 19         wavelength from said second semiconductor laser
  - 20       through the use of the inputted signal light so that the
  - 21       output light falls into an opposite phase condition with
  - 22       respect to the inputted signal light;
  - 23         a first filter for extracting a light with said second
  - 24         wavelength from the output light from said second

25 semiconductor optical amplifier;  
26        a third semiconductor optical amplifier for  
27 intensity-modulating the output light with said first  
28 wavelength from said first semiconductor laser through  
29 the use of said light with said second wavelength  
30 extracted through said first filter so that the output  
31 light falls into an opposite phase condition with respect  
32 to said second-wavelength light;  
33        multiplexing means for multiplexing the output  
34 lights from said first and third semiconductor optical  
35 amplifiers; and  
36        a second filter for extracting a light with said first  
37 wavelength from a multiplexed light from said  
38 multiplexing means.

1        2. The wavelength converter according to claim 1,  
2 further comprising optical phase adjusting means  
3 interposed between said third semiconductor optical  
4 amplifier and said multiplexing means to adjust a phase  
5 of the output light from said third semiconductor optical  
6 amplifier for adjusting a phase difference between the  
7 output light from said first semiconductor optical  
8 amplifier and the output light from said third  
9 semiconductor optical amplifier.

1       3. The wavelength converter according to claim 1,  
2 further comprising an optical intensity adjusting unit  
3 interposed between said third semiconductor optical  
4 amplifier and said multiplexing means to adjust an  
5 optical intensity of the output light from said third  
6 semiconductor optical amplifier with respect to the  
7 output light from said first semiconductor optical  
8 amplifier.

1       4. The wavelength converter according to claim 3,  
2 further comprising:  
3              an opto-electric converter for receiving the  
4 inputted signal light to convert the inputted signal light  
5 into an electric signal; and  
6              a control circuit responsive to said electric signal  
7 from said opto-electric converter to monitor an average  
8 photoelectric power of the inputted signal light for  
9 controlling said optical intensity adjusting unit on the  
10 basis of said average photoelectric power of the inputted  
11 signal light for adjusting the optical intensity of the  
12 output light from said third semiconductor optical  
13 amplifier.

1       5. The wavelength converter according to claim 3,  
2 further comprising:

3           a third filter for extracting a light with said first  
4 wavelength from the output light from said first  
5 semiconductor optical amplifier;  
6           an opto-electric converter for receiving the  
7 extracted light from said third filter to convert the  
8 extracted light into an electric signal;  
9           a peak detection circuit for receiving the  
10 converted electric signal outputted from said  
11 opto-electric converter to detect a lower-base intensity  
12 level of the converted electric signal, and  
13           a control circuit for receiving the lower-base  
14 intensity level of the converted electric signal to  
15 monitor a lower-base intensity level of the output light  
16 with said first wavelength from said first  
17 semiconductor optical amplifier for controlling said  
18 optical intensity adjusting unit on the basis of said  
19 lower-base intensity level of the output light with first  
20 wavelength to adjust the optical intensity of the  
21 output light from said third semiconductor optical  
22 amplifier.

1       6. The wavelength converter according to claim 3,  
2 further comprising:  
3           an opto-electric converter connected to said second  
4 filter for receiving the extracted light with said first

5 wavelength from said second filter to convert the  
6 extracted light into an electric signal;

7 a peak detection circuit for receiving the converted  
8 electric signal outputted from said opto-electric  
9 converter to detect a lower-base intensity level of the  
10 converted electric signal, and

11 a control circuit for receiving the lower-base  
12 intensity level of the converted electric signal to  
13 monitor a lower-base intensity level of the output light  
14 with said first wavelength from said first semiconductor  
15 optical amplifier for controlling said optical intensity  
16 adjusting unit on the basis of said lower-base intensity  
17 level of the output light with first wavelength to adjust  
18 the optical intensity of the output light from said third  
19 semiconductor optical amplifier.

1 7. The wavelength converter according to claim 1,  
2 further comprising:

3 a third semiconductor laser for outputting a light  
4 with a constant intensity and with a third wavelength;  
5 second multiplexing means connected to said third  
6 semiconductor optical amplifier and further connected to  
7 said first to third semiconductor laser for multiplexing  
8 the output lights from said first to third semiconductor  
9 lasers, with the multiplexed light with said first to

10 third wavelengths being inputted to said third  
11 semiconductor optical amplifier.

1 8. The wavelength converter according to claim 7,  
2 further comprising:

3 an opto-electric converter for receiving the  
4 inputted signal light to convert the inputted signal light  
5 into an electric signal; and

6 a control circuit responsive to said electric signal  
7 from said opto-electric converter to monitor an average  
8 photoelectric power of the inputted signal light for  
9 controlling said optical intensity adjusting unit on the  
10 basis of said average photoelectric power of the inputted  
11 signal light for adjusting the optical intensity of the  
12 output light from said third semiconductor optical  
13 amplifier.

1 9. The wavelength converter according to claim 7,  
2 further comprising:

3 a third filter for extracting a light with said first  
4 wavelength from the output light from said first  
5 semiconductor optical amplifier;

6 an opto-electric converter for receiving the  
7 extracted light from said third filter to convert the  
8 extracted light into an electric signal;

9           a peak detection circuit for receiving the converted  
10      electric signal outputted from said opto-electric  
11      converter to detect a lower-base intensity level of the  
12      converted electric signal, and

13           a control circuit for receiving the lower-base  
14      intensity level of the converted electric signal to  
15      monitor a lower-base intensity level of the output light  
16      with said first wavelength from said first semiconductor  
17      optical amplifier for controlling said optical intensity  
18      adjusting unit on the basis of said lower-base intensity  
19      level of the output light with first wavelength to adjust  
20      the optical intensity of the output light from said third  
21      semiconductor optical amplifier.

1       10. The wavelength converter according to claim 7,  
2      further comprising:

3           an opto-electric converter connected to said  
4      second filter for receiving the extracted light with said  
5      first wavelength from said second filter to convert the  
6      extracted light into an electric signal;

7           a peak detection circuit for receiving the  
8      converted electric signal outputted from said  
9      opto-electric converter to detect a lower-base intensity  
10     level of the converted electric signal, and  
11           a control circuit for receiving the lower-base

12 intensity level of the converted electric signal to  
13 monitor a lower-base intensity level of the output light  
14 with said first wavelength from said first  
15 semiconductor optical amplifier for controlling said  
16 optical intensity adjusting unit on the basis of said  
17 lower-base intensity level of the output light with first  
18 wavelength to adjust the optical intensity of the  
19 output light from said third semiconductor optical  
20 amplifier.

1 11. The wavelength converter according to claim 1,  
2 wherein a portion of or all of the components of said  
3 wavelength converter are formed on a semiconductor  
4 substrate in an integrated condition.

1 12. The wavelength converter according to claim 1,  
2 wherein said first semiconductor laser is a  
3 wavelength-variable type laser.

1 13. An optical cross connect system comprising:  
2 a wavelength-demultiplexing type optical filter  
3 for demultiplexing a multiplexed optical signal with a  
4 plurality of wavelengths into a plurality of optical  
5 signals each having the corresponding wavelength;

6           a plurality of wavelength converters connected to  
7    said wavelength-demultiplexing type optical filter for  
8    receiving said plurality of optical signals as inputted  
9    signal lights, each of said wavelength converters  
10   including:

11                 a first wavelength-variable type  
12    semiconductor laser for outputting a light with a  
13    constant intensity and with a first wavelength forming  
14    a wavelength to be obtained when the corresponding  
15    inputted signal light undergoes wavelength conversion  
16    in this wavelength converter;

17                 a first semiconductor optical amplifier for  
18    intensity-modulating the output light with said first  
19    wavelength from said first semiconductor laser through  
20    the use of the inputted signal light so that the output  
21    light falls into an opposite phase condition with  
22    respect to the inputted signal light;

23                 a second semiconductor laser for outputting  
24    a light with a constant intensity and with a second  
25    wavelength different from that of the inputted signal  
26    light and that of the output light from said first  
27    semiconductor laser;

28                 a second semiconductor optical amplifier for  
29    intensity-modulating the output light with said second  
30    wavelength from said second semiconductor laser

31 through the use of the inputted signal light so that the  
32 output light falls into an opposite phase condition with  
33 respect to the inputted signal light;

34 a first filter for extracting a light with said  
35 second wavelength from the output light from said  
36 second semiconductor optical amplifier;

37 a third semiconductor optical amplifier for  
38 intensity-modulating the output light with said first  
39 wavelength from said first semiconductor laser through  
40 the use of the light with said second wavelength  
41 extracted through said first filter so that the output  
42 light falls into an opposite phase condition with  
43 respect to the second-wavelength light;

44 multiplexing means for multiplexing the  
45 output lights from said first and third semiconductor  
46 optical amplifiers; and

47 a second filter for extracting a light with  
48 said first wavelength from a multiplexed light from  
49 said multiplexing means; and

50 an optical coupler for multiplexing the extracted  
51 lights outputted from of said second filters of said  
52 plurality of wavelength converters.